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FEDERAL AID TO FISH AND WILDLIFE RESTORATION

ST. JOE RIVER CUTTHROAT TROUT AND NORTHERN SQUAWFISH STUDIES

Job Performance Report

Project F-60-R-6

Job No. 1. Life History of St. Joe River Cutthroat Trout (Research)

by

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and

Job No. 2. Squawfish Studies--St. Joe River

by

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Period Covered: 1 March 1974 to 28 February 1975

May, 1975

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JOB PERFORMANCE REPORT

State of Idaho

Name: ST. JOE RIVER CUTTHROAT TROUT AND NORTHERN SQUAWFISH STUDIES

Project No. F-60-R-6

Job No. 1

Title: Life History of St. Joe River Cutthroat Trout

Period Covered: 1 March 1974 to 28 February 1975

ABSTRACT

In 1973 the Idaho Fish and Game Commission closed four tributaries of the lower St. Joe River (Reeds, Bond, Trout, and Mica creeks) to angling. To evaluate the effects of these closures on cutthroat trout populations in tributaries and the St. Joe River, we assessed the abundance, species composition and movements of trout in the closed tributaries, in tributaries open to angling and in tributaries of the upper river with "trophy fish" regulations.

After one year of closure, cutthroat trout abundance and size had increased in the closed tributaries. The largest increases in abundance occurred in sections of the closed streams accessible by road. We observed the largest densities of cutthroat in inaccessible sections of the closed streams and the abundance of fish increased only a small amount in those sections.

Brook trout exceeded cutthroat in abundance only in the meadow section of Mica Creek. Cutthroat densities more than doubled in the Mica meadow section from 1973 to 1974. Rainbow trout of hatchery origin had virtually disappeared from Big Creek in 1974 after the cessation of stocking, while cutthroat doubled in abundance in the lower sections of the creek.

We tagged and released 5,200 salmonids in the St. Joe River and tributaries in 1973 and 1974 and recovered 460 of the fish. Twenty-one cutthroat trout (4.6% of recoveries) migrated from nine different tributaries into the St. Joe River.

We conducted a creel census on Big Creek to determine angler effort and catch from a tributary and to assess angler opinions on tributary fishing. Anglers made an estimated 1016 angling trips and creeled 1346 cutthroat trout in Big Creek during the census period. Cutthroat trout comprised 86% of the catch. Catch rates in the unroaded zone were nearly six times larger than in the roaded zone of Big Creek. The majority of the anglers were Idaho residents, used flies or worms, and fished the roaded zone.

Nearly two-thirds of the anglers who fished Big Creek preferred to catch cutthroat trout or had no species preference. Most anglers thought the quality of fishing had declined in recent years and stated that some type of restrictive regulations or supplemental stocking was needed to improve angling success or quality. A majority of the anglers would support restrictive regulations on tributary streams to improve the cutthroat fishery in the main river, but less than half would accept closure of tributaries to angling to improve the river fishery.

Submitted by: R. F. Thurow and T. C. Bjornn
Idaho Cooperative Fishery Research Unit

RECOMMENDATIONS:

Evaluation of the role of tributaries in the production of cutthroat trout for the main river fishery should be continued in 1975 to get full benefit from the fish tagging effort in 1973 and 1974. Project personnel should continue to catch and release fish to monitor size and age of fish in the tributaries and continue to count fish in transects to assess abundance.

OBJECTIVES:

To collect and assess selected life history and ecological data on cutthroat trout in the St. Joe River drainage; including status of population, prevailing growth rates, age and size at maturity, migration patterns, distribution, abundance, and factors affecting yield of juveniles in tributary streams.

To evaluate the contribution of lower-river tributaries to the cutthroat fishery of the St. Joe River. To evaluate the effects of closure to fishing on cutthroat populations in tributaries of the St. Joe River.

To determine angler effort and catch on a tributary of the St. Joe River open to angling and to assess opinions of tributary anglers regarding the fishery.

TECHNIQUES USED:

Evaluation of Tributary Closures

Starting in 1973, the Idaho Fish and Game Commission closed four tributaries of the lower St. Joe River (Reeds, Bond, Trout, and Mica creeks) to angling at the request of local sportsmen to increase the abundance of trout in the St. Joe River. We initiated studies in 1973 to determine if the closure of the tributaries to angling would increase the abundance of cutthroat trout *(Salmo clarki lewisi,* Girard) in these tributaries and eventually in the St. Joe River. The most direct method of evaluating the contribution of each tributary to the river fishery would be to place a weir at the mouth of each tributary where we could capture and enumerate all fish entering and leaving the stream. However, the difficulty of successfully screening spring run-off flows and the cost involved dictated that we use other, indirect methods of evaluating the closures.

Therefore, we assessed the abundance, species composition, and movements of cutthroat trout populations in selected tributaries by transect counts with snorkeling gear, tagging fish with jaw tags, angling by project personnel, and limited weir operations.

Transect Counts:

We studied the four streams closed to angling in the lower portion of the St. Joe drainage, two streams (Big and Marble creeks) that were open to angling in the lower portion of the drainage, and two streams (Quartz and Simmons creeks) that were under special "trophy fish" regulations in the upper portion of the drainage (Figure 1). We counted fish in selected transects in each of the eight study streams in 1973 and 1974. Bjornn and Thurow (1974) described the methodology of transect selection,snorkeling counts of fish in the transects, and density determinations.

Transects in the study streams included many habitat types and we recorded substrate, pool characteristics, permanent bank cover, and accessibility for each study stream section (Table 1). We measured the physical dimensions of each transect in 1973 and 1974 within each stream section (Table 2).

Tagging:

To assess movement of cutthroat trout and to determine which tributaries provide fish for the river fishery, we tagged as many cutthroat as possible in the St. Joe River and tributaries. We used a barbless fly to capture fish and attached numbered, monel metal tags to the mandible of all wild trout larger than 130 mm before releasing them at the capture site. We recorded species, total length, tag number, date and location of capture for each fish tagged and released.

To obtain tag returns and recapture information, we fished the St. Joe River and the tributaries where we had tagged fish in 1973. We posted signs along the lower St. Joe River to inform anglers of the tagging program and provided information on where to send or deposit tag recovery information. We also placed tag deposit boxes in six local establishments and ran newsreleases in local newspapers.

Length-Frequency Comparison:

We recorded the total length of each trout (tagged and untagged) captured by project personnel monthly throughout the summer to compare length-frequency distributions of fish in 1973 with those in 1974.

Weir Operation:

In 1974, we constructed a weir in Trout Creek approximately 200 yards upstream from the St. Joe River to monitor downstream migration of trout. We recorded all fish captured in the weir before releasing them and tagged all salmonids. We also installed a maximum-minimum thermometer to record water temperatures.

Creel Census:

We conducted a creel census on Big Creek, a tributary of the lower St. Joe River in 1974. We divided the 1974 season into three intervals as follows:

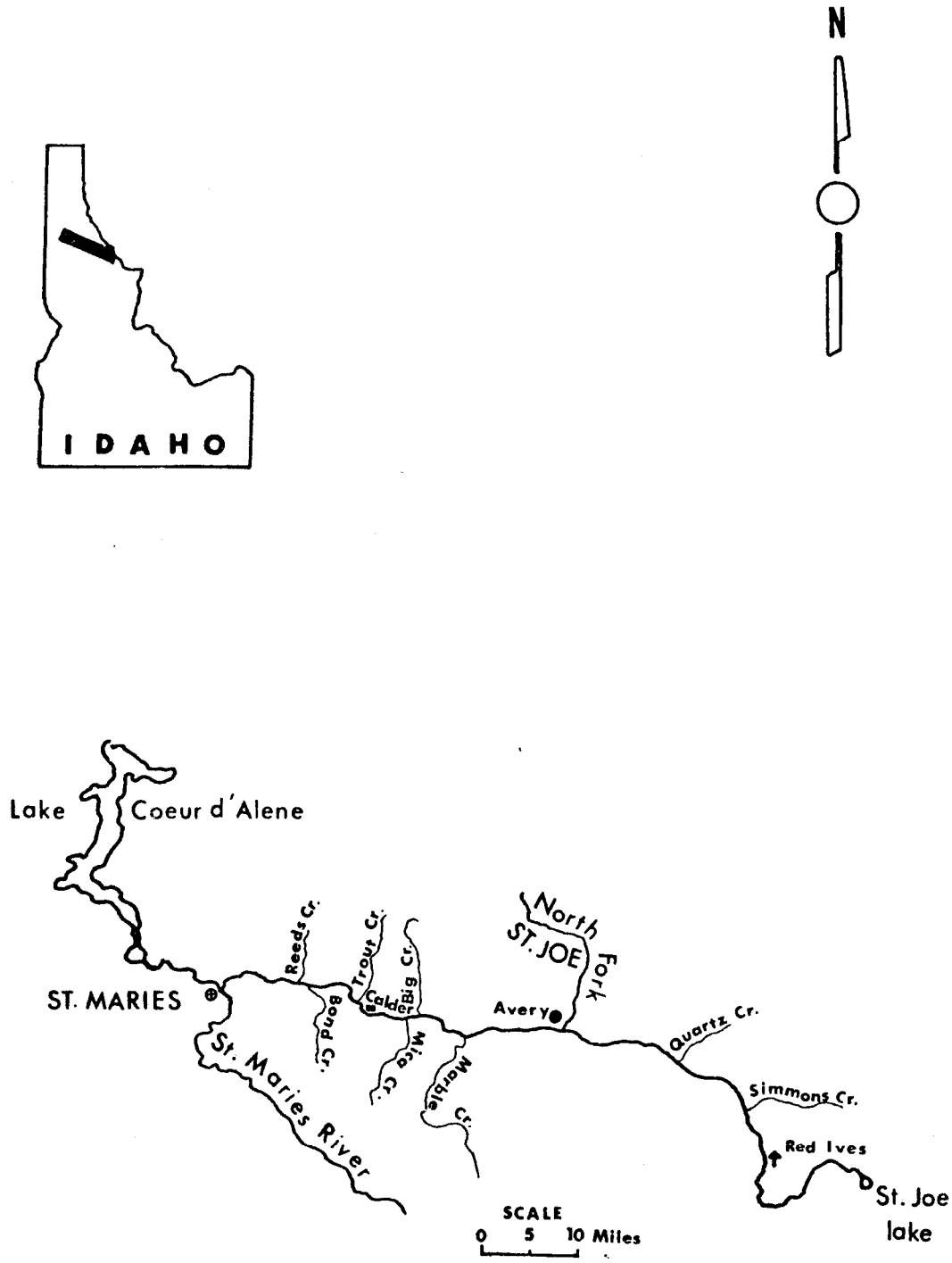

Figure 1. St. Joe River drainage, Idaho and location of study streams.

Table 1. Physical Characteristics of Streams in vicinity of study sections.

Stream	Section	River miles from creek mouth	General Stream Characteristics			Accessibility Use
			Substrate	Pool Characteristics	Bank Cover	
Reeds Cr.	Lower	0.9	gravel	small pools	conifer canopy sparse brush	access by road moderate grazing
	Upper	1.5	gravel-rubble	numerous pools	conifer canopy sparse brush	no access road or trail
Bond Cr.	Lower	2.0	clay-silt	pools as long runs	open pasture, sparse brush	heavy grazing, bank erosion, access by road
	Middle	3.3	silt-gravel basalt rubble	shallow pools, overhanging logs	slight forest canopy, primarily brush	moderate grazing no access road or trail
	Upper	4.5	silt-gravel basalt rubble	shallow pools	slight conifer canopy, primarily brush	some logging (access by road)
Trout Cr.	Lower	0.6	gravel-rubble	large pools	sparse forest canopy	moderate grazing access by road
	Middle	2.0	rubble-large boulder	numerous deep pools in steep rocky gorge	sparse forest canopy	no access road, trail to lower end
	Upper	5.6	sand-gravel	numerous small pools, overhanging logs	slight forest canopy, primarily brush	rough access road
Mica Cr.	Lower	0.6	gravel-rubble	numerous large pools, rock ledges along pools	primarily brush	access by road

Table 1. (continued)

Stream	Section	River miles from creek mouth	General Stream Characteristics			Accessibility Use
			Substrate	Pool Characteristics	Bank Cover	
	Middle	3.0	gravel-rubble boulder	numerous deep pools in steep rocky gorge	sparse forest canopy	no road access, long, steep trail
	Upper	7.8	silt-sand gravel	pools as long runs in wide meadow	primarily brush interspersed with grasses and sedges	access by road moderate grazing
Big Cr.	Lower	1.8	gravel-rubble	numerous large pools, rock ledges along pools	primarily brush	access road stream
	Middle	5.0	gravel-rubble	numerous large pools, rock ledges along pools	primarily brush	access road parallels stream
	Upper	9.8	gravel-rubble boulder	numerous pools, rock outcrops present	primarily brush, some forest canopy	access by trail
Marble Cr.	Lower	5.4	gravel-rubble boulder	pools sparse and very large	sparse forest canopy	access road stream
	Upper	13.3	gravel-rubble boulder	numerous pools, rock ledges along pools	primarily brush, some forest canopy	access by road, trail to upper end
Quartz Cr.	Lower	0.5	gravel-rubble boulder	numerous pools, overhanging logs	sparse forest canopy	access road stream
	Upper	2.0	gravel-rubble boulder	numerous pools, overhanging logs	primarily brush, sparse forest canopy	access road stream
Simmons Cr.	Lower	0.5	gravel-rubble boulder	few pools, pools al long runs	primarily brush	access by road or trail
	Upper	2.5	gravel-rubble boulder	numerous pools, overhanging logs	primarily brush	access by trail

Table 2. Physical characteristics and mean dimensions of snorkeling transects in each study stream section.

Fishing Regulations and stream	Section	Date Surveyed	Summer flow (cfs)	Temp. °C Max	Temp. °C Min	Transect Measurement (in feet), 1973 Surface Length	Surface Width	Surface Area	Thalweg depth	Thalweg Volume-[2]	Transect Measurement (in feet), 1974 Surface Length	Surface Width	Surface Area	Thalweg depth	Thalweg Volume-[3]
Closed to Fishing															
Reeds Creek	Lower	July 30	15.0	17.0	12.0	26.4	12.1	319.4	1.2	287.5	26.8	11.6	310.9	1.4	342.0
	Upper	July 30	--	15.0	12.0	25.0	19.0	475.0	1.8	665.0	25.0	18.3	457.5	2.0	685.8
Bond Creek	Lower	Aug. 1	13.8	21.0	17.0	61.4	15.6	957.8	1.5	1053.6	72.4	18.0	1303.2	1.7	1694.2
	Middle	Aug. 6	--	19.0	14.0	41.2	13.4	552.1	1.5	607.3	43.6	13.5	588.6	2.0	882.9
	Upper	Aug. 5	-	18.0	14.0	60.6	13.8	836.8	1.4	920.5	63.8	14.2	906.0	1.5	996.6
Trout Creek	Lower	Aug. 7	10.6	17.5	12.0	102.2	19.0	1941.8	1.6	2330.2	95.6	21.1	2017.2	1.7	2622.4
	Middle	Aug. 8	--	15.0	11.0	58.2	18.3	1065.1	2.4	1917.2	64.0	18.5	1184.0	2.3	2012.8
	Upper	Aug. 9	--	13.0	11.0	34.8	16.8	584.6	1.5	643.1	47.2	18.7	882.6	1.4	970.9
Mica Creek	Lower	Aug. 12	26.1	15.5	10.0	83.0	21.1	1751.3	1.9	2451.8	72.2	24.6	1776.1	1.9	2486.5
	Middle	Aug. 17	--	14.0	10.0*	89.0	25.8	2296.2	2.5	4362.8	92.0	27.5	2530.0	2.7	5060.0
	Upper	Aug. 13	--	13.0	8.5*	57.6	19.2	1105.9	1.5	1216.5	80.2	16.4	1315.3	1.5	1446.8
Open to Fishing															
Big Creek	Lower	Aug. 14	33.8	16.0	11.0	138.2	31.7	4380.9	2.2	7447.5	155.4	33.2	5159.3	2.5	9802.7
	Middle	Aug. 14	--	15.0	9.0[3]	97.0	26.4	2560.8	2.8	5377.7	72.2	23.7	1711.1	3.1	3935.5
	Upper	Aug. 15	--	14.0	12.5-	61.0	19.9	1213.9	1.8	1699.5	70.8	19.5	1380.6	1.9	1932.8
Marble Creek	Lower	Aug. 19	--	13.5	10.5	169.4	46.9	7944.9	3.9	23040.2	159.8	42.4	6775.5	4.4	22,359.2
	Upper	Aug. 20	--	12.0	7.0	99.9	26.6	2638.7	2.8	5541.3	114.2	31.5	3597.3	3.2	8633.5
Special Regulations															
Quartz Creek	Lower	Aug. 22	12.8	11.0	9.0	56.0	18.8	1052.8	2.0	1579.2	60.2	20.5	1234.1	2.2	1974.6
	Upper	Aug. 23	--	10.0	7.5	49.4	18.3	904.0	2.1	1446.4	58.4	16.7	975.3	2.1	1560.5
Simmons Creek	Lower	Aug. 29	41.3	15.5	9.0	86.2	29.0	2499.8	1.7	3249.7	84.2	29.6	2492.3	1.6	2990.8
	Upper	Aug. 30	--	15.5	9.0	52.0	24.9	1294.8	2.5	2460.1	51.2	23.3	1193.0	2.4	2147.4

1/ Flow data collected by Mauser (1970) during July and August, 1969.
2/ Volume of pool equal to surface area x 3/4 thalweg depth.
3/ Water temperature observed at 1300 hours on survey date.
*Water temperature observed at 1000 hours on survey date.

Interval	Inclusive Dates
I	22 June- 12 July
II	13 July- 10 Aug.
III	11 Aug. - 1 Sept.

Within each interval we randomly selected seven weekdays and four weekend days or holidays as census days.

A census clerk, stationed at the mouth of Big Creek, interviewed all anglers leaving the creek by the single access road. We contacted all anglers leaving the stream as they completed their fishing trips on each census day from 0900 hours to darkness.

The clerk interviewed all anglers to assess size of party, angler residence, stream section fished, fishing method, catch composition, and catch per angler day. Whenever possible, the clerk measured all creeled fish by species. After this information was recorded, the clerk asked each angler being interviewed their opinions on fishing preferences, attitudes toward tributary fishing and acceptable stream management procedure.

We estimated the number of angler days per interval as follows:

$$\text{Angler Days} = \bar{x}_D$$

where

$\bar{x}$ = mean number of anglers counted for all weekday or weekend days censused during an interval.

D = Number of days (weekday or weekend day) per interval.

Since anglers occasionally camped along Big Creek and fished for two or more days. We asked each angler we interviewed the number of days he had fished (in addition to the day censused) on that fishing trip. We incorporated a correction factor based upon the incidence of extra angling days per trip into our estimated angling effort.

$$\text{Additional days} = \bar{x}\ D$$

where

$\bar{x}$ = mean number of extra angling days per weekday or weekend day during an interval.

D = number of days (weekday or weekend day) per interval.

Total estimated angler days per interval was calculated by the addition of the means for censused days and extra days.

where

$$\text{Total angler days} - (\bar{x} + \bar{x})D$$

The estimated catch was the product of the estimated total angler days per interval multiplied by the mean catch per angler day. The mean catch per angler day was based upon the catch recorded on census days.

Beaver Creek Studies

In 1974 we continued studies in Beaver Creek to assess the abundance of cutthroat trout in the stream. We did not release cutthroat trout fry into Beaver Creek in 1974, however, we used snorkeling gear and counted fish in the test sections as we had in previous years studies. Beginning in July, we made four counts at ten day intervals of all trout (fry and older) in every fourth pool of test sections 3 and 4 in Beaver Creek following the methods of Mauser (1972).

FINDINGS:

Evaluation of Tributary Closures

Transect Counts:

In 1974, we observed cutthroat trout in all sections of the study streams (Table 3) and the following species in some sections of the study streams: brook trout, *Salvelinus fontinalis* (Mitchell); rainbow trout, *Salmo gairdneri* (Richardson); dolly varden trout, *Salvelinus malma* (Walbaum); mountain whitefish, *Prosopium williamsoni* (Girard); northern squawfish, *Ptychocheilus oregonensis* (Richardson); redside shiner, *Richardsonius balteatus* (Richardson); speckled dace, *Rhinichthys osculus* (Girard); longnose dace, *Rhinichthys cataractae* (Valenciennes); sculpin, *Cottus spp.* Kokanee, *Onchorhynchus nerka* (Walbaum) spawned in the lower section of Trout Creek in November. In 1974, we observed three dolly varden trout in the transects. Two were present in the middle section of Mica Creek and one in the upper section of Simmons Creek (Table 3).

We counted more cutthroat trout in most sections of the study streams in 1974 as compared to 1973 (Table 4). The number of large cutthroat (>250 mm TL) we counted per transect increased in most study sections (Table 5). The largest increases of large fish occurred in sections of the closed streams. The largest densities of large cutthroat were present in the streams which have been protected by a "trophy-fish" regulation since 1971 (Table 6).

In general, we counted more cutthroat trout in the upper or more inaccessible sections of each study stream (Tables 1 and 7). The smaller numbers of cutthroat in the lower portions of each stream may have been due to a combination of factors including: angler harvest (current or previous), unsuitable water temperatures, and inadequate spawning recruitment.

The increased number of cutthroat we observed in the transects resulted in an increased density of fish in most stream sections in 1974 compared to 1973 although the physical dimensions of the transects were slightly larger in 1974 (Tables 2 and 7). We observed the largest densities of cutthroat in sections of Reeds, Bond, and Trout creeks in both 1973 and 1974. These three streams were closed to fishing in 1973.

Table 3. Mean number of fish counted per transect in sections of each study stream, 1974.

Stream	Section	S.ecies	Fr	Fish/transect by size groups (mm) <100	100-150	150-200	200-250	250-300	>300	Total w/o fry
Closed to fishing										
Reeds Creek	Lower	Cutthroat	0.8	2.8	2.6	1.8	1.2	-	-	8.4
		Brook trout	-	-	0.6	1.2	0.8	0.6	0.2	3.4
										11.8
	Upper	Cutthroat	2.0	1.4	2.4	5.2	4.2	0.2	-	13.4
		Brook trout	-	-	-	0.2	-	0.2	0	0.4
										13.8
Bond Creek	Lower	Cutthroat	5.4	-	3.4	3.4	0.8	-	-	7.6
		Brook trout	-	-	0.2	1.2	1.0	0.6	0.4	3.4
										11.0
	Middle	Cutthroat	6.2	0.8	4.8	4.8	1.8	0.2	-	12.4
		Brook trout	-	0.2	0.4	0.4	0.4	0.6	0.2	2.2
										14.6
	Upper	Cutthroat	19.0	0.6	4.6	3.4	1.6	0.2	-	10.4
		Brook trout	-	-	-	-	-	0.2	-	0.2
										10.6
Trout Creek	Lower	Cutthroat	21.2	1.4	5.6	4.8	1.4	0.4	-	13.6
		Brook trout	-	-	-	0.2	-	0.2	-	0.4
										14.0
	Middle	Cutthroat	24.6	-	3.2	5.0	3.0	1.2	0.8	13.2
		Brook trout	-	-	0.2	-	-	-	-	0.2
										13.4
	Upper	Cutthroat	44.6	12.8	18.4	13.0	3.0	0.4	0.4	48.0

Table 3. (continued)

Stream	Section	Species	Fish/transect by size groups (mm) Fry	<100	100-150	150-200	200-250	250-300	>300	Total w/o fry
Mica Creek	Lower	Cutthroat	4.0	-	2.0	4.0	0.8	0.8	-	7.6
		Brook trout	-	-	-	-	-	0.2	0.2	0.4
										8.0
	Middle	Cutthroat	31.8	-	2.2	4.0	1.6	1.0	1.2	10.0
		Brook trout	0.2	-	-	0.2	-	-	-	0.2
		Dolly Varden	-	-	-	-	0.2	0.2	-	0.4
		Adipose-clip rainbow	-	-	-	-	-	-	0.2	0.2
										10.8
	Upper	Cutthroat	0.4	1.6	2.0	3.0	1.0	-	-	7.6
		Brook trout	14.2	0.6	9.2	8.8	1.8	0.4	0.4	21.2
										28.8
Open to fishing										
Big Creek	Lower	Cutthroat	2.8	-	2.6	5.6	0.6	-	-	8.8
		Brook trout	-	-	0.4	0.4	-	-	-	0.8
		Native rainbow	-	-	-	-	0.6	-	-	0.6
		Hatchery rainbow	-	-	-	-	-	0.2	-	0.2
										10.4
	Middle	Cutthroat	2.8	-	4.2	5.8	0.8	-	-	10.8
		Native rainbow	-	-	-	0.2	-	-	-	0.2
		Hatchery rainbow	-	-	-	-	-	-	0.2	0.2
	Upper	Cutthroat	14.6	0.2	6.2	9.8	2.8	1.0	0.2	20.2

Table 3. (continued)

Stream	Section	Species	Fish/transect by size groups (mm) Fr	<100	100-150	150-200	200-250	250-300	>300	Total w/o fry
Marble Creek	Lower	Cutthroat	-	-	0.2	3.0	0.5	-	-	3.7
		Hatchery rainbow	-	-	-	1.0	3.5	0.5	0.2	4.3
										8.0
	Upper	Cutthroat	-	0.2	3.8	8.4	2.0	0.6	0.2	15.2
Trophy regulations										
Quartz Creek	Lower	Cutthroat	12.0	2.2	4.0	7.4	3.4	2.0	0.4	19.4
	Upper	Cutthroat	6.2	4.0	4.0	6.2	2.2	1.2	-	17.6
Simmons Creek	Lower	Cutthroat	2.2	-	5.2	6.6	3.0	2.0	0.4	17.2
	Upper	Cutthroat	0.2	-	2.6	3.4	2.2	0.8	0.2	**9.2**
		Dolly Varden	-	-	-	0.4	-	-	-	0.4
										9.6

Table 4. Mean numbers of cutthroat trout (age 1 and older) counted per transect in sections of each study stream, 1973 and 1974.

Stream	Section	Cutthroat per transect 1973	1974	Change, 1973 to 1974 Number
Closed to Fishing				
Reeds Creek	Lower	4.8	8.4	3.60 75.00
	Upper	12.6	13.4	0.80 6.00
Bond Creek	Lower	9.8	7.6	- 2.20 - 22.0
	Middle	12.0	12.4	.40 3.0
	Upper	10.0	10.4	.40 4.0
Trout Creek	Lower	6.4	13.6	7.20 113.0
	Middle	15.0	13.2	- 1.80 - 12.0
	Upper	28.0	48.0	20.0 71.0
Mica Creek	Lower	4.4	7.6	3.20 73.0
	Gorge	6.6	10.0	3.40 52.0
	Upper	3.6	7.6	4.00 111.0
Open to Fishing				
Big Creek	Lower	3.0	8.8	5.8 193.0
	Middle	8.0	10.8	2.8 25.0
	Upper	24.6	20.2	- 4.4 - 18.0
Marble Creek	Lower	2.8	3.7	.9 32.0
	Upper	9.6	15.2	5.6 58.0
Special Regulations				
Quartz Creek	Lower	15.0	19.4	4.4 29.0
	Upper	14.6	17.6	3.0 21.0
Simmons Creek	Lower	13.0	17.2	4.2 32.0
	Upper	14.8	9.2	- 5.6 - 38.0

Table 5. Mean numbers of large cutthroat (>250 mm total length) counted per transect in section of the study streams,1973 and 1974.

Stream	Section	1973 Mean number per transect	1973 Percentage of fish counted	1974 Mean number per transect	1974 Percentage of fish counted
Closed to Fishing:					
Reeds Creek	Lower	0.0	0.0	0.0	0.0
	Upper	0.0	0.0	0.2	1.49
Bond Creek	Lower	0.0	0.0	0.0	0.0
	Middle	0.0	0.0	0.2	1.61
	Upper	0.0	0.0	0.2	1.92
Trout Creek	Lower	0.2	3.13	0.4	2.94
	Middle	0.4	2.67	2.0	15.15
	Upper	0.6	2.14	0.8	1.67
Mica Creek	Lower	0.2	4.54	0.8	10.53
	Gorge	1.8	27.27	2.2	22.0
	Meadow	0.0	0.0	0.0	0.0
		x = 0.29		x = 0.63	
Open to Fishing					
Big Creek	Lower	0.0	0.0	0.0	0.0
	Middle	0.0	0.0	0.0	0.0
	Upper	0.4	1.63	1.2	5.94
Marble Creek	Lower	0.2	7.14	0.0	0.0
	Middle	0.8	8.33	0.8	5.26
		x = 0.28		x = 0.4	
Special Regulations					
Quartz Creek	Lower	0.6	4.00	2.4	12.37
	Upper	0.0	0.0	1.2	6.82
Simmons Creek	Lower	1.8	13.85	2.4	13.95
	Upper	3.2	21.62	1.0	10.87
		R = 1.4		= 1.75	

Table 6. Mean numbers of large cutthroat trout (>250 mm total length) counted per transect grouped by the type of angling regulations, and the percentage increase.

Angling regulation on tributary	Large cutthroat per transect 1973	1974	Percentage increase
Closed	0.29	0.63	117.2
Open	0.28	0.40	42.9
Trophy fish	1.40	1.75	25.0

Table 7. The densities of (age 1 and older) cutthroat trout observed in test sections of the study streams in 1973 and 1974 and the percentage change.

Stream	Section	Cutthroat per 100 ft.[2] 1973	1974	Change %	Cutthroat per 100 ft.[3] 1973	1974	Change %
Closed to Fishing							
Reeds Creek	Lower	1.50	2.70	80.0	1.67	2.46	47.3
	Upper	2.65	2.93	10.6	1.89	1.95	3.2
Bond Creek	Lower	1.02	0.58	-43.1	0.93	0.45	-51.6
	Middle	2.17	2.11	- 2.8	1.98	1.40	-29.3
	Upper	1.20	1.15	- 4.2	1.09	1.04	- 4.6
Trout Creek	Lower	0.33	0.67	103.0	0.27	0.52	92.6
	Middle	1.41	1.11	-21.3	0.78	0.66	-15.4
	Upper	4.79	5.44	13.6	4.35	4.94	13.6
Mica Creek	Lower	0.25	0.43	72.0	0.18	0.31	72.2
	Middle	0.29	0.40	37.9	0.15	0.20	33.3
	Upper	0.33	0.58	75.7	0.30	0.52	73.3
Open to Fishing							
Big Creek	Lower	0.07	0.17	142.9	0.04	0.09	125.0
	Middle	0.31	0.63	103.2	0.15	0.27	80.0
	Upper	2.03	1.46	-28.1	1.45	1.04	-28.3
Marble Creek	Lower	0.04	0.05	25.0	0.01	0.02	100.0
	Upper	0.36	0.42	16.7	0.18	0.18	0.0
Special Regulations							
Quartz Creek	Lower	1.42	1.57	10.6	0.95	0.98	3.1
	Upper	1.62	1.80	11.1		1.01	11.9
Simmons Creek	Lower	0.52	0.69	32.7	0.40	0.58	45.0
	Upper	1.14	0.77	-32.5	0.60	0.43	-28.3

The largest increases in densities of cutthroat trout per transect occurred in accessible sections of the closed streams (Tables 1, 7 and 8).

The increases in density in the accessible sections of Reeds, Trout, and Mica creeks probably reflect a recovery of the cutthroat trout population to a higher density after angler harvest was eliminated. Similar increases in density of cutthroat trout did not occur in the relatively inaccessible sections of these same tributaries where high densities were already present in some cases. Such increases also did not occur in the open tributaries or those under the "trophy-fish" regulations.

In general, we observed more cutthroat trout fry in the upper sections of each stream (Table 9). The larger densities in these sections may have been due to a combination of factors including optimum stream gradient and substrate size for spawning and suitable rearing areas for fry. The largest increases in number of fry counted per transect occurred in sections of Bond, Trout, Mica, and Big creeks from 1973 to 1974. The increased numbers of cutthroat fry generally coincided with increased numbers of (age 1 and older) cutthroat counted in 1974 compared to 1973. However, fry also increased in sections where only slight increases in numbers of (age 1 and older) cutthroat occurred. We observed fewer cutthroat fry in sections of Reeds, Marble and Simmons creeks in 1974 compared to 1973. Due to the high stream discharges, the relatively late spring runoff in 1974 and the cooler water temperatures, we suspect cutthroat fry may not have been fully emerged at the time of the 1974 counts in these sections. This was apparently the case in Reeds Creek since we observed more cutthroat fry along the pool edges nine days after we completed the transect counts than we had prior to the counts.

Brook and rainbow trout were present in the lower sections of the lower tributaries (Table 3). Brook trout were more abundant than cutthroat only in the meadow section of upper Mica Creek. The abundance of brook trout increased by a small amount of this section while cutthroat abundance more than doubled from 1973 to 1974 (Table 4). Rainbow trout of hatchery origin virtually dissappeared from sections of Big Creek in 1974 when stocking was discontinued (Figure 2). Densities of wild cutthroat trout in these lower sections of Big Creek more than doubled.

Tagging:

We tagged over 5,200 salmonids in tributaries of the St. Joe River in 1973 and 1974 (Table 10). We tagged the majority of these fish in the eight study streams although we fished in tributaries throughout the drainage.

We recovered 460 tagged fish during 1973 and 1974 (Table 11). Of these recoveries, twenty-one cutthroat (4.6%), originally tagged in tributaries, had migrated downstream to the St. Joe River. These twenty-one fish migrated from nine different tributaries to the St. Joe River (Table 12). We expended more effort angling in the tributaries than in the main stem of the St. Joe River, therefore, we believe a larger percentage (than 4.6%)

Table 8. Percentage increases in the numbers of cutthroat trout (age 1 and older) counted per transect from 1973 to 1974 by stream accessibility and type of angling regulation.

Angling regulation on tributary	Section accessibility	Percentage Increase Cutthroat per 100 ft.^{2}
Closed	accessible	82.7
	inaccessible	20.7
Open	accessible	25.0
	inaccessible	16.7
Trophy fish	accessible	18.1

Table 9. Mean numbers of cutthroat trout fry counted per transect in each study section, 1973 and 1974.

Stream	Section	Mean no. trout per transect 1973	1974	Change, 1973 to 1974 Numbers	
Closed to Fishing					
Reeds Creek	Lower	4.2	0.8	-3.4	-80.9[1/]
	Upper	6.4	2.0	-4.4	-68.7-
Bond Creek	Lower	5.0	5.4	0.4	8.0
	Middle	.6.8	6.2	-0.6	- 8.8
	Upper	6.4	19.0	12.6	196.9
Trout Creek	Lower	9.4	21.2	11.8	125.5
	Middle	8.4	24.6	16.2	192.9
	Upper	11.0	44.6	33.6	305.5
Mica Creek	Lower	3.8	4.0	0.2	5.3
	Middle	15.2	31.8	16.6	109.2
	Upper	0.6	0.4	-0.2	-33.3
Open to Fishing					
Big Creek	Lower	0.2	2.8	2.6	1300.0
	Middle	5.6	2.8	-2.8	-50.0
	Upper	15.8	14.6	-1.2	-7.6
Marble Creek	Lower	0.0	0.0	-	- 1/
	Upper	0.4	0.0	- .4	-100.0
Special Regulations					
Quartz Creek	Lower	9.8	12.0	2.2	22.4
	Upper	8.8	6.2	-2.6	-29.5
Simmons Creek	Lower	n.c.[2/]	2.2	-	- 1/
	Upper	3.4	0.2	-3.2	-94.1

[1/] Cutthroat fry may not have been fully emerged.

[2/] n.c. - No fry counts made.

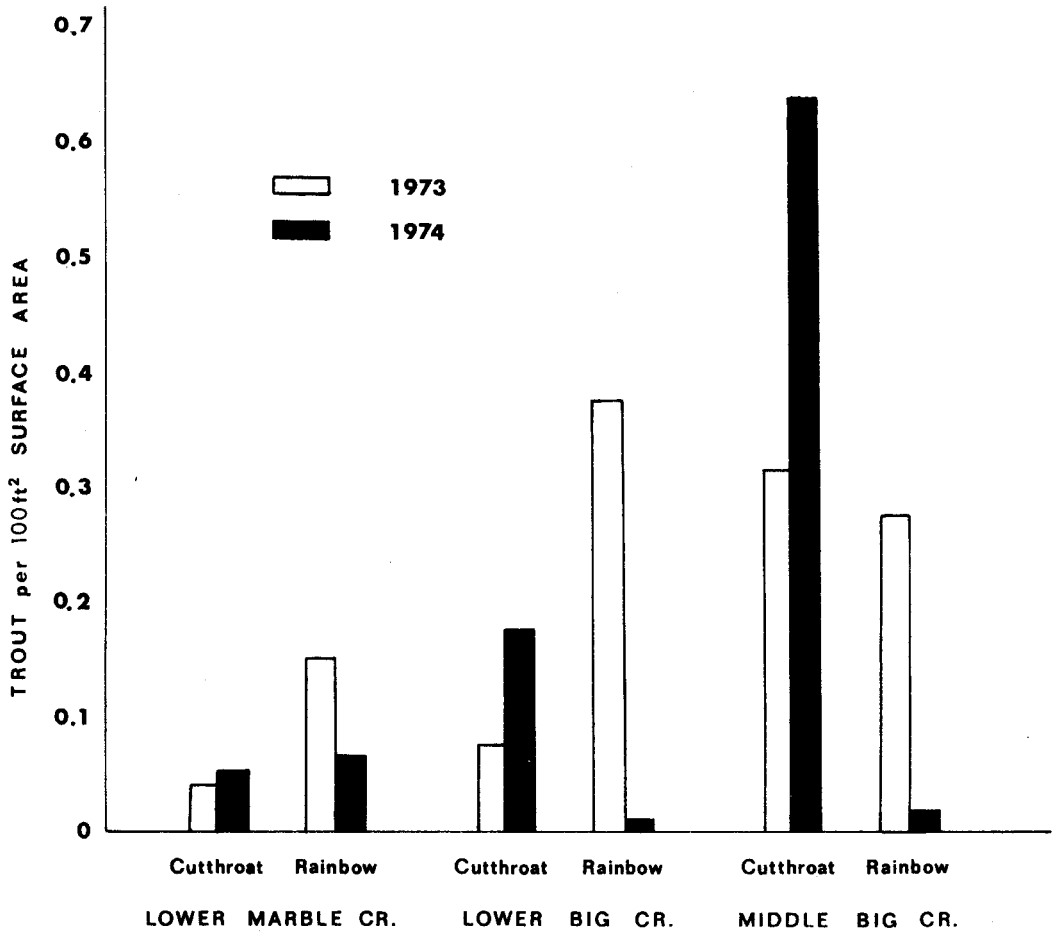

Figure 2. Mean densities of cutthroat trout and hatchery rainbow trout observed in stream sections where both species were present, 1973 and 1974.

Table 10. Numbers of cutthroat and other salmonids tagged and recovered in the St. Joe River and tributaries during 1969, 1970, 1973 and 1974.

	Number tagged			Usable returns		
Year	River	Tributaries	Total	River	Tributaries	Total
1969	293	730	1023	29	4	33
1970	609	469	1078	77	44	121
1973	217	1738	1955	9	44	55
1974	34	3509	3543	39	395	434

Table 11. The number of cutthroat trout tagged and released in tributary streams and recovered in the St. Joe River or tributaries during 1973 and 1974. Multiple recaptures in parentheses.

Location tagged	Recovered in tributaries			Recovered in St. Joe River			Total recovered	% recovered in river
	1973	1974	Total	1973	1974	Total		
Reeds Creek	10	60(10)	70	--	--	--	70	--
Bond Creek	5	48(3)	53	--	1	1	54	1.85
Trout Creek	11	112(1)	123		3	3	126	2.38
Mica Creek	10(1)	96(6)	106	1	6	7	112	5.36
Big Creek	--	14	14	--	--	--	14	--
Marble Creek	--	12(1)	12	--	--	--	12	--
Quartz Creek	3	30(2)	33	1	1	2	35	5.71
Simmons Creek	--	17	18	--	3	3	21	14.29
Upper tributaries	4	6	10	1	4	5	15	33.33
Slate Creek		2	2	--	--	--	2	
Skookum Creek	--	--	--	--	1	1	1	
Bird Creek	--	1	1		2	2	3	
Eagle Creek	1	--	1	--	--	--	1	
Bluff Creek	--	2	2	1		1	3	
Beaver Creek	3	--	3	--	--	--	3	
Red Ives Creek	--	1	1	--	1	1	2	
Total	44	395	439	3	18	21	460	4.56%
Percentage	10.02	89.98	100.0	15.0	85.0	100.0	100.0	

Table 12. The location of tributaries in the St. Joe River drainage from which cutthroat trout migrated to the St. Joe River, 1973 and 1974.

Location of Tributaries in the St. Joe River drainage	Area description	Number of tributaries from which cutthroat migrated
Slackwater	Falls Creek to Coeur d'Alene Lake	1
Lower River	Falls Creek to Marble Creek	2
Middle River	Marble Creek to Prospector Creek	2
Upper River	Upstream from Prospector Creek	4
	Total	9

of the tributary fish enter the St. Joe River. The remainder of the tagged fish (95.4%) were recaptured in the same tributaries where they were originally tagged.

Most of the cutthroat which we tagged in the tributaries and subsequently recovered in the St. Joe River were 150 to 200 millimeters total length when tagged (Figure 3). Based upon age and growth data from Averett (1963) we concluded these were age class II fish in their third summer of life.

A majority of the cutthroat trout which migrated from tributaries to the St. Joe River were tagged in June and July (Figures 4 and 5). Cutthroat trout which were tagged and recaptured with the same year were usually captured within one mile of the tributaries confluence in the St. Joe River. However, fish recaptured one year after being tagged were usually recaptured farther than one mile from the tributary confluence. Some cutthroat tagged in the summer of 1973 and recaptured the following summer exhibited considerable downstream movements. This movement may further substantiate the belief that many cutthroat in the St. Joe River migrate downstream in fall and upstream in the spring and early summer. The cutthroat which entered the St. Joe River from tributaries also exhibited this migration pattern.

In 1973, we tagged 38 cutthroat trout as they migrated downstream past a weir we installed in the St. Joe River near Big Eddy (Bjornn and Thurow, 1974). In 1974, we recaptured five of these fish; four upstream from the weir site (Table 13). These movements substantiate our belief that cutthroat in the St. Joe River move downstream in fall, and upstream in spring and early summer as Rankel (1971) observed. A majority of the cutthroat which migrated past the weir near Big Eddy in 1973 were 200 to 250 millimeters total length (Figure 6). This indicates that some of the immature (smaller) fish as well as the larger fish both migrated downstream in the fall.

Length-Frequency Comparison:

In 1974, the largest increases in mean total length of cutthroat trout captured by project personnel occurred in sections of Bond, Trout, and Mica creeks (Table 14). In general, no large increases in length occurred in the other study streams.

We also captured more large cutthroat trout (>250 mm total length) in the closed streams in 1974 compared to 1973. In 1973 we captured large cutthroat in five of the ten stream sections and in 1974 we captured large cutthroat in nine of the ten stream sections.

In general, the trout we captured in the upper or more inaccessible sections of each study stream were larger (mean total length) than fish we captured in lower or accessible stream sections. Large cutthroat comprised a higher proportion of the fish we caught in 1974 compared to 1973 in the inaccessible sections. The length-frequency data collected in a section of Mica Creek (Figure 7) illustrates the differences we observed between accessible and inaccessible sections in the study streams.

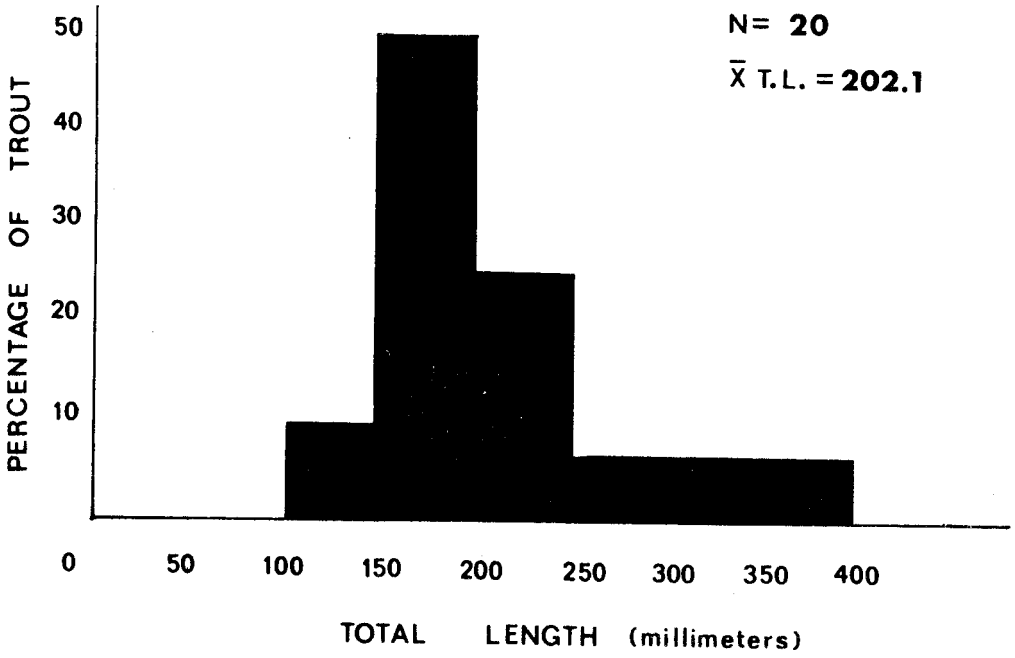

Figure 3. Length frequencies of tagged cutthroat trout which migrated from tributaries to the St. Joe River in 1973 and 1974.

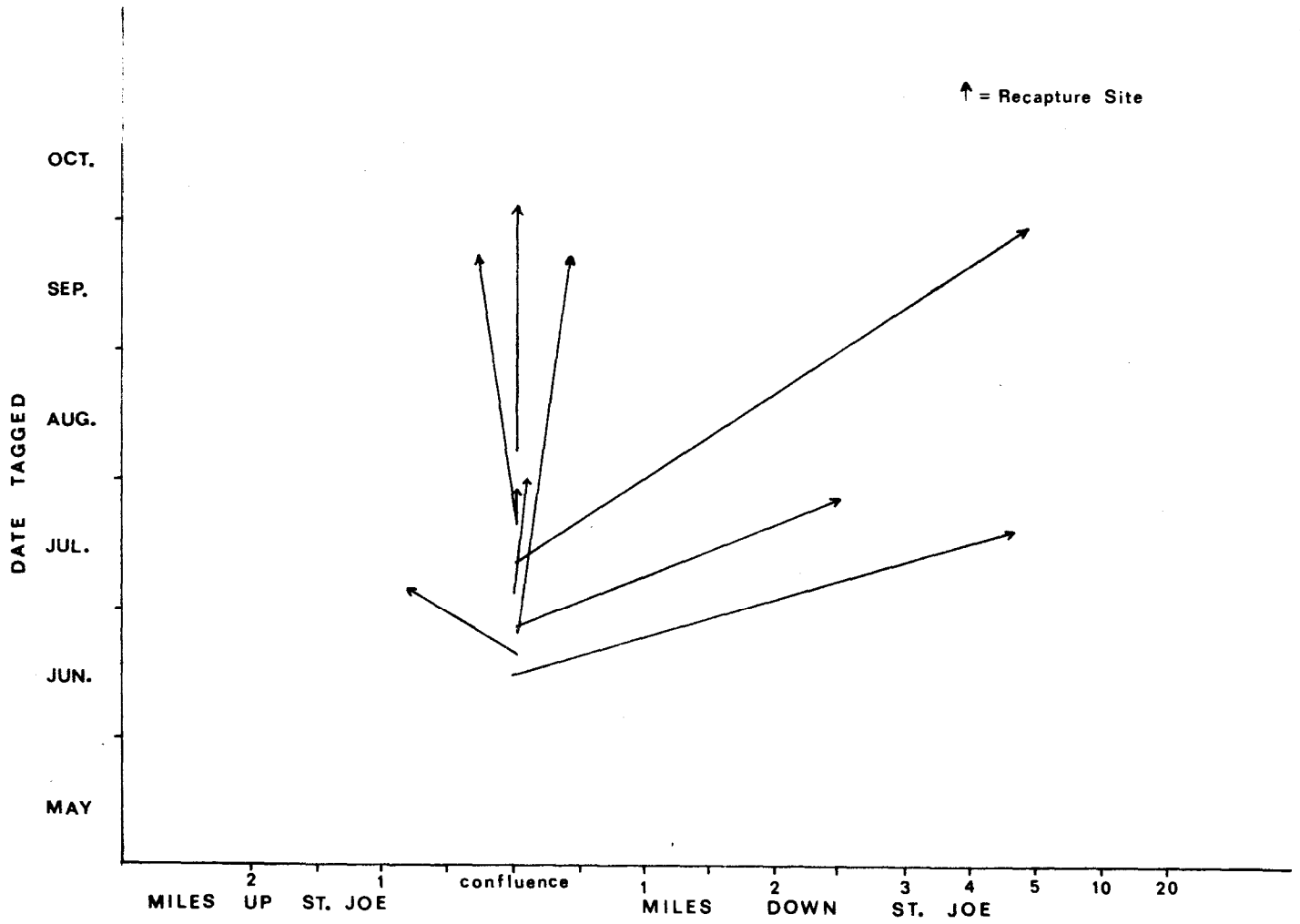

Figure 4. Movement of cutthroat trout from tributaries to the St. Joe River. Includes fish tagged and recovered within the same year.

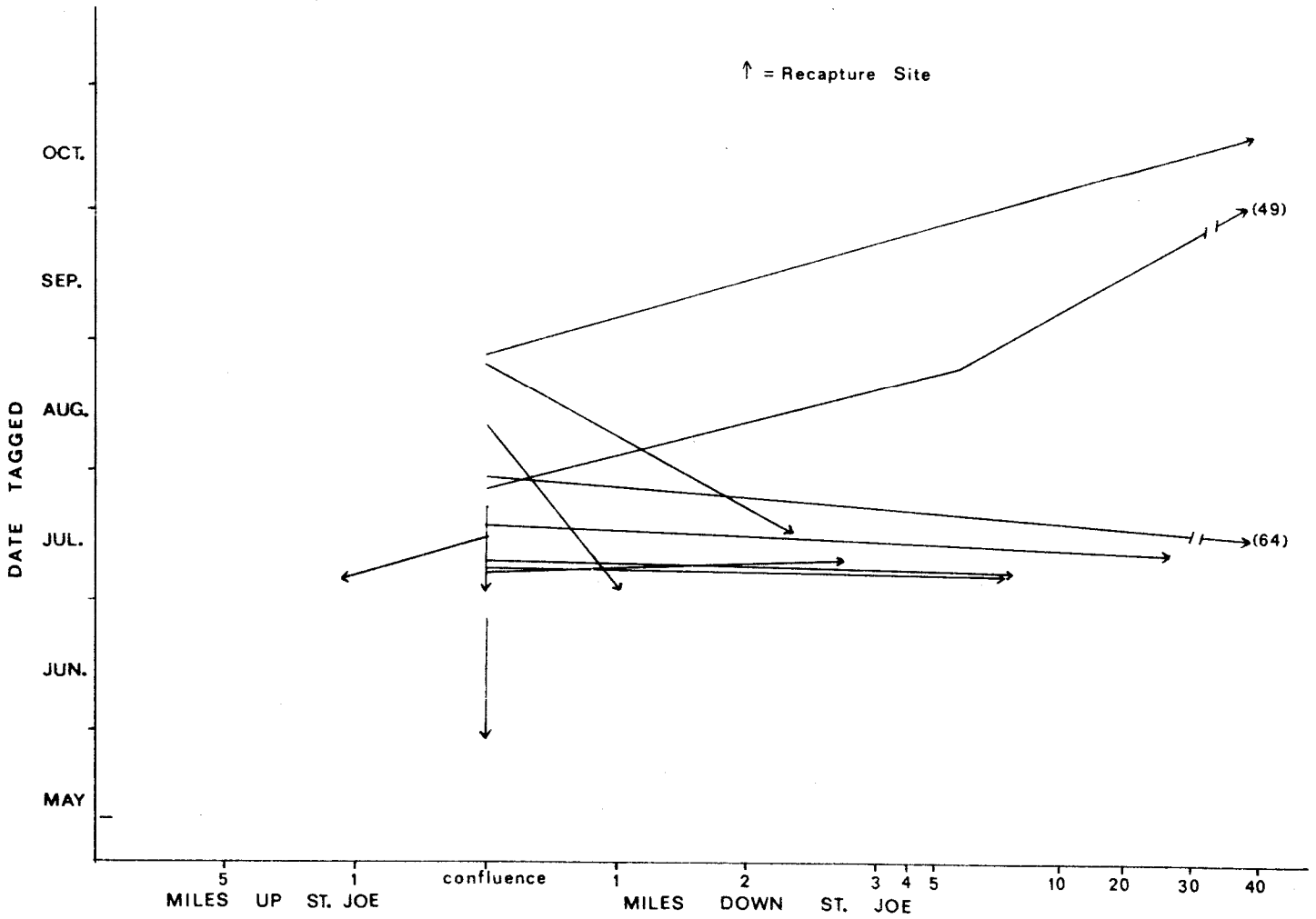

Figure 5. Movement of cutthroat trout from tributaries to the St. Joe River. Includes fish tagged and recovered within the same year.

Table 13. Movement of cutthroat trout tagged while migrating downstream past the weir in the St. Joe River near Big Eddy.

Date and location		Total length	
Release	Recovery	at release	Movement
14 Sept. 1973 Big Eddy Weir	14 August 1974 near Sisters Creek	262 mm	33.3 mile upstream
17 Sept. 1973 Big Eddy Weir	9 July 1974 below Calder	257 mm	4.3 mile upstream
21 Sept. 1973 Big Eddy Weir	30 Sept. 1973 below Big Eddy	268 mm	.2 mile downstream
21 Sept. 1973 Big Eddy Weir	7 July 1974 below Big Creek	273 mm	9.0 mile upstream
25 Sept. 1973 Big Eddy Weir	5 July 1974 near Tin Can Flat	171 mm	39.0 mile upstream

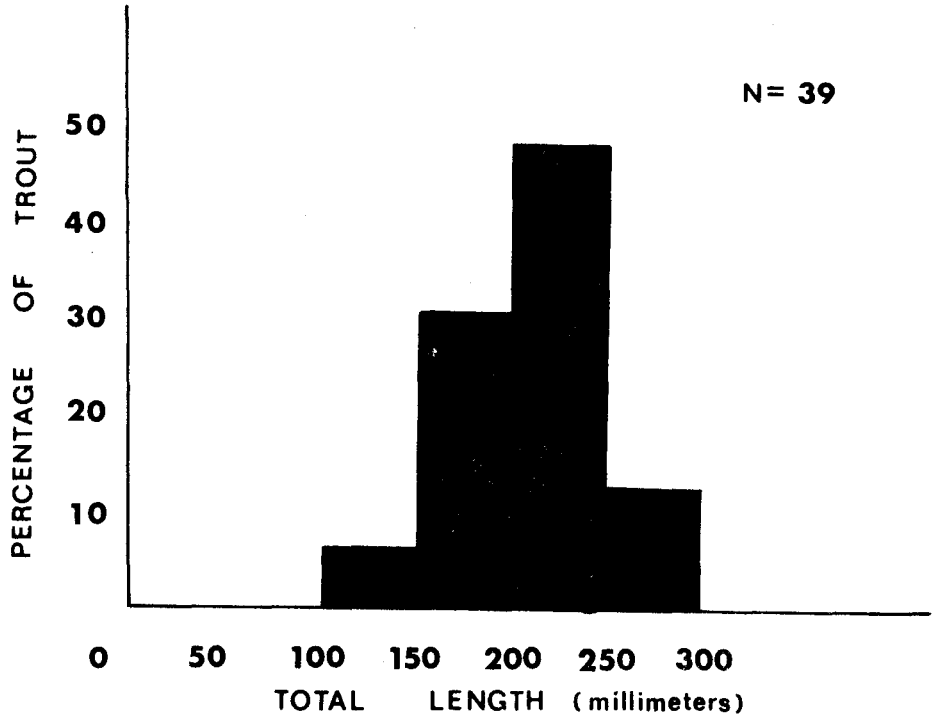

Figure 6. Length frequencies of cutthroat trout which migrated past the weir in the St. Joe River near Big Eddy, September and October, 1973.

Table 14. The mean total length and percentage of large cutthroat trout (>250 mm) captured by angling in the study streams in 1973 and 1974.

Stream and type of regulation	Stream section	Month sampled	1973 Data: Fish in sample	1973 Data: Mean Total length (mm)	1973 Data: Trout >250 mm: Number	1973 Data: Trout >250 mm: Percentage
Closed to Angling						
Reeds Creek	Upper	July	21	167.2	--	--
Bond Creek	Lower Pasture	June	21	134.8	--	--
	Lower	June	238	129.2	--	--
	Upper	June	92	147.3	--	--
Trout Creek	Lower	June	44	168.6	3.	6.8
	Middle	June	21	150.1	1.	4.8
	Upper	June	267	144.4	1.	0.4
Mica Creek	Lower	July	33	163.6	1	3.0
	Gorge	July	38	192.3	9	23.7
	Meadow$_1$/	July	51	149.5	--	--
	Meadow-	July	48	163.4	--	--
Open to Angling						
Big Creek	Upper	Aug.	23	169.7	--	--
Marble Creek	Upper	Aug.	53	170.9	--	--
Trophy-Fish Regulations						
Quartz Creek	Lower	July	66	171.2	2	3.0
	Upper	Aug.	36	166.0	--	--

Table 14. (continued)

Stream and type of regulation	Stream section	Month sampled	Fish in sample	Mean Total length (mm)	Trout >250 mm Number	Trout >250 mm Percentage
			1973 Data			
Simmons Creek	Lower	July	45	198.3	7	15.6
	Upper	Aug.	17	197.7	2	11.8
Eagle Creek	Lower	Aug.	103	147.7	3	2.9
			1974 Data			
Closed to Angling						
Reeds Creek	Upper	July	33	170.8	2	6.1
Bond Creek	Lower Pasture	June	25	173.6	3	12.0
	Lower	June	102	130.3	1	1.0
	Upper	June	63	155.0	1	1.6
Trout Creek	Lower	June	48	166.1	3	6.3
	Middle	June	18	183.2	1	5.6
	Upper	June	56	151.0	--	--
Mica Creek	Lower	July	80	161.1	2	2.5
	Gorge	July	69	186.9	7	10.1
	Meadow1/	July	124	165.7	--	--
	Meadow	July	88	159.1	--	--

Table 14. (continued)

Stream and type of regulation	1974 Data					
	Stream section	Month sampled	Fish in sample	Mean Total length (mm)	Trout >250 mm	
					Number	Percentage
Open to Angling						
Big Creek	Upper	July	84	164.9	2	2.4
Marble Creek	Upper	Aug.	63	168.7	1	1.6
Trophy-Fish Regulations						
Quartz Creek	Lower	July	157	170.7	4	2.5
	Upper	July	47	176.6	3	6.4
Simmons Creek	Lower	Aug.	97	180.6	8	8.2
	Upper	Aug.	126	187.0	11	8.7
Eagle Creek	Lower	July	112	154.8	2	1.8

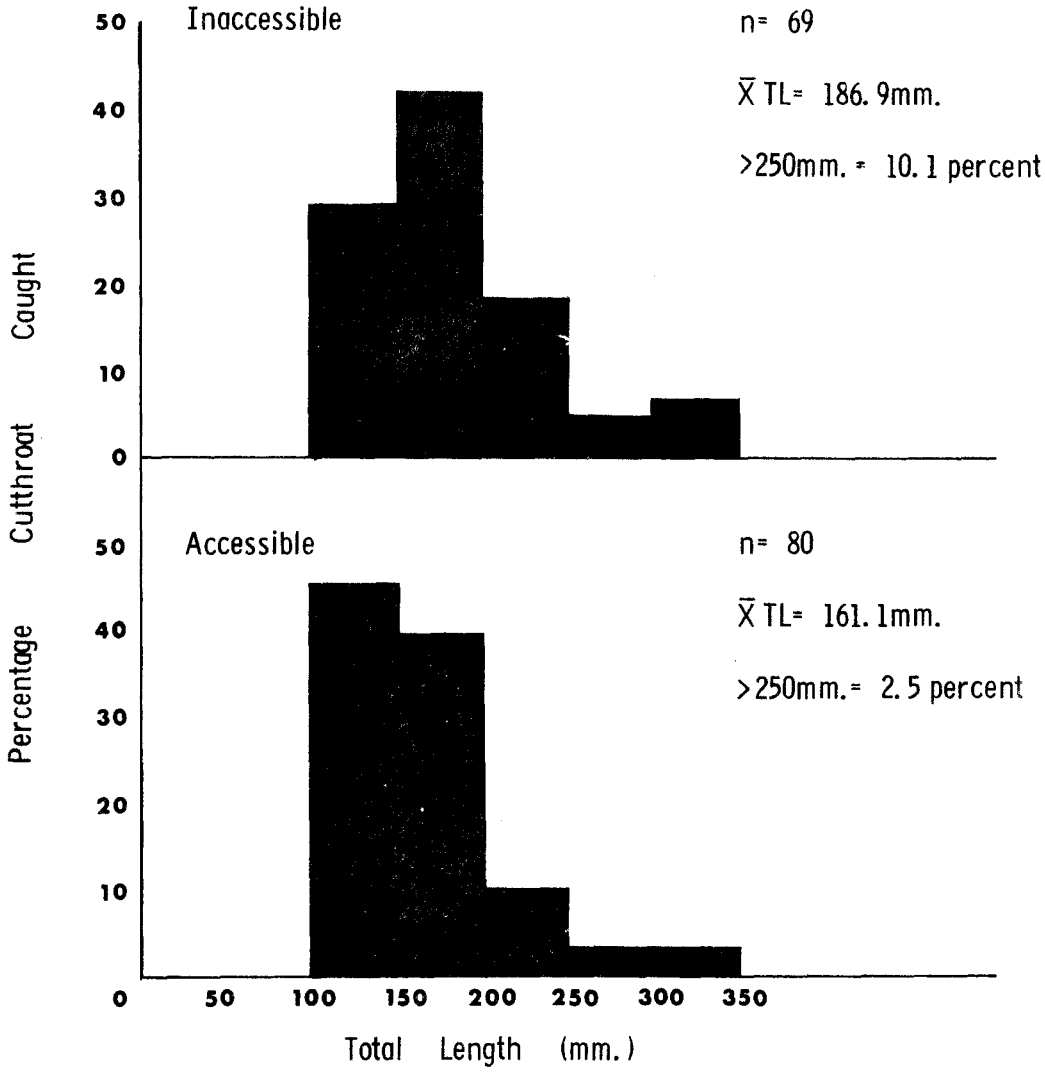

Figure 7. Length frequencies of cutthroat trout caught in two sections of Mica Creek in July, 1974.

As previously mentioned, cutthroat and brook trout coexisted in the meadow section of Mica Creek. In 1974 the mean total length of the cutthroat we captured increased by 15 millimeters as compared to 1973. During the same period the mean total length of the brook trout we captured remained approximately the same as it was in 1973 (Table 14).

In May and June of 1974, we captured a high proportion of large cutthroat (>250 mm total length) in lower Bond, Trout and Mica creeks in sections where few large cutthroat were caught the duration of July and August. The lower percentage of large fish captured as the summer progressed may indicate the presence of large spawners which migrate out of the tributaries after spawning.

Weir Operation - 1974:

We installed a weir in Trout Creek near its mouth and captured one spent male cutthroat (379 mm total length) and ten juvenile cutthroat from June 1 to June 30, 1974. The juvenile fish we captured were 50% age II and 50% age III based upon age and growth data from Averett (1963).

Due to the high spring flows we were not able to construct the weir before June 1. In addition the flows remained high to June 17 so that we were not able to maintain a fish tight trap. Therefore, our catch from June 1 to June 17 was a minimum of the actual downstream movement. The minimum water temperatures from June 1 to June 30 ranged from 6° C to 11^0 C and the maximum temperatures from 7° C to 16^0 C.

During October, we captured one brook trout and fifteen sculpin and in November four brook trout, one cutthroat trout and eight sculpin.

Creel Census:

We estimated anglers made 1,016 angling trips and harvested 1,346 cutthroat trout from Big Creek from June 22 to September 1, 1974 (Table 15). The smallest catch per angler day occurred in interval I and was probably due to the relatively high streamflow in Big Creek at that time.

The average party size was 2.1 anglers during 1974 (Table 16). The proportion of resident anglers utilizing Big Creek decreased as the summer progressed. A majority (60%) of the anglers were Idaho residents followed by residents of Washington.

The proportion of fly fishermen decreased as the summer progressed. The proportion of anglers who utilized flies; worms; or combinations of flies, live bait, or lures were similar.

A majority (71%) of the anglers fished the easily accessible roaded zone of Big Creek although the catch per angler day was six times larger in the unroaded zone than in the roaded zone (Figure 8). The catch rate within the unroaded zone increased from two to five fish per angler day from Interval I to Interval II. The increased catch rate was probably due to

Table 15. The estimated number of angler days fished and cutthroat trout caught in Big Creek by anglers in 1974.

	Big Creek		
Interval	Angler days	Fish creeled	Catch/angler day
I	314.	304.	.97
II	405.	566.	1.40
III	297.	476.	1.60
Total	1016.	1346.	1.32

Table 16. Angler responses during the Big Creek creel census for census intervals I, II, and III, 1974.

Category	Census interval I	II	III	and means	Total
Number fisherman sampled	33	35	30		98
Mean size of party	2.06	3.40	1.83		2.11
Angler residence (%)					
Idaho	73.7	57.1	46.4		60.4
Washington	15.7	31.4	42.9		28.7
California	5.3	8.6	7.1		6.9
Other	5.3	2.9	3.6		4.0
No. sampled	33	35	28		101
Stream section fished (%)					
Roaded	63.6	80.0	66.7		71.4
Above road	24.2	20.0	30.0		24.5
Both	9.1	--	3.3		4.1
East Fork	4.1	--	--		1.4
No. sampled	33	35	30		98
Bait used (%)					
Fly	45.4	28.6	26.7		33.7
Worm	27.3	40.0	30.0		32.6
Multiple	21.3	22.9	30.0		24.5
Other Live	--	2.8	13.3		5.1
Spin Lure	6.1	5.7	--		4.1
No. sampled	33	35	30		98

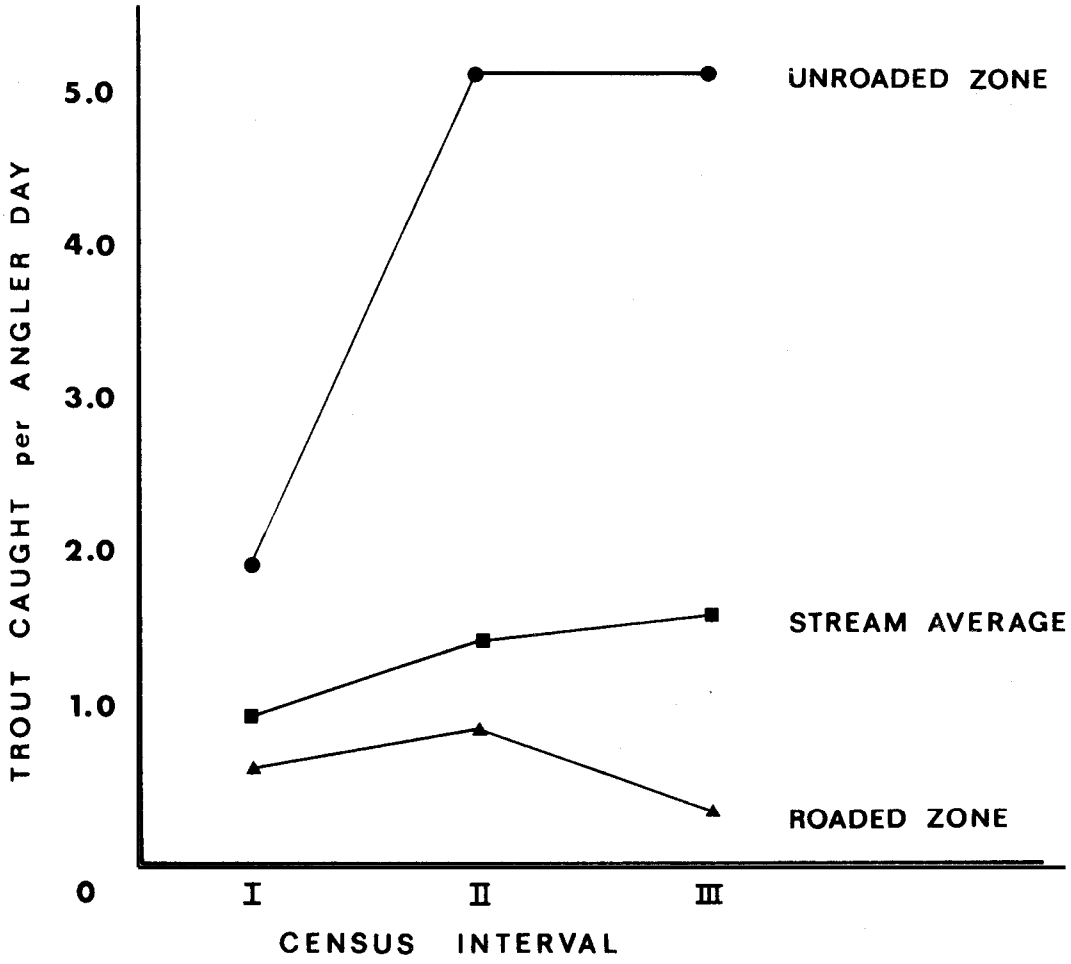

Figure 8. Catch per angler day for cutthroat trout during the Big Creek creel census, by interval and zone, 1974.

lower water levels after Interval I. The catch rate within the roaded zone, however, declined as the summer progressed.

Anglers caught mostly cutthroat trout from Big Creek in 1974 (Table 17). The proportion of rainbow trout creeled decreased as the summer progressed. The majority of the cutthroat trout we checked during the census averaged 185 to 195 millimeter total length (Figure 9). Large cutthroat (>250 mm total length) comprised six percent of the observed catch.

Angler Opinion Survey:

A majority of the anglers who fished Big Creek preferred to catch cutthroat or had no species preference, believed the quality of fishing had declined in recent years and would accept some type of restrictive regulation or supplemental stocking to improve angling quality. Although a large percentage of the anglers preferred fishing tributary streams, a majority favored restrictive regulations on tributary streams when these regulations benefitted the cutthroat fishery in the main St. Joe River. A majority of the anglers, however, did not favor closure of tributary streams as a means to improve the cutthroat fishery in the St. Joe River.

The specific questions we posed to anglers and their responses (as percentages of people in sample) are listed on the following pages.

1. Question: How would you rate the fishing in Big Creek?

Response:	Intervals			All Intervals
	I	II	III	
Poor	46.1	43.7	55.6	48.2
Fair	30.8	31.3	18.5	27.1
Good	23.1	25.0	25.9	24.7
Anglers interviewed	26	32	27	85

2. Question: Are there any species which you prefer to catch while fishing in Big Creek?

Response:	Intervals			All Intervals
	I	II	III	
Cutthroat	43.2	38.2	29.6	37.8
No preference	29.7	32.4	51.9	36.8
Brook trout	8.1	8.8	7.4	8.2
Rainbow trout	10.8	5.9	3.7	7.1
Cutthroat and rainbow	5.4	8.8	3.7	6.1
Cutthroat and brook		5.9		2.0
Other (Brown, Golden)	2.7		3.7	2.0
Anglers interviewed	37	34	27	98

3. Question: How does fishing in Big Creek in 1974 compare to other years?

Response:	Intervals I	II	III	All Intervals
Declining	61.1	73.7	87.5	73.6
No change	38.9	21.0	12.5	24.5
Improving	--	5.3	--	1.9
Anglers interviewed	18	19	16	53

4. Question: Does fishing in Big Creek need improvement? If yes, how could we improve fishing.

Response:	Intervals I	II	III	All Intervals
Yes	69.2	81.3	88.0	79.5
No	30.8	18.7	12.0	20.5
Anglers interviewed	26	32	25	83
Restrictive Regulations	38.4	40.0	33.4	37.7
Stocking	23.2	35.0	58.3	37.7
Closure	30.7	--	8.3	11.1
Closure and Stocking	--	20.0	--	8.9
Other (don't stock rainbow)	7.7	5.0	--	4.4
Anglers interviewed	13	20	12	45

5. Question: Do you prefer fishing tributary streams to fishing the main St. Joe River? If yes, why?

Response:	Interval I	II	III	All Intervals
Yes	91.8	93.9	91.7	92.6
No	8.1	6.1	8.3	7.4
Anglers interviewed	37	33	24	94
Easy access	29.4	30.0	18.2	26.7
Better fishing	32.4	6.7	18.2	19.8
Esthetics	17.6	10.0	13.6	13.9
Less fishermen	5.9	16.7	18.2	12.8
Access and fishing	5.9	--	--	2.3
Camping	--	3.3	--	1.2
Other	8.8	33.3	31.8	23.3
Anglers interviewed	34	30	22	86

6. Question: If restrictive regulations on tributary streams benefitted the cutthroat fishery in the main river would you favor these regulations:

Response:	Interval I	II	III	All Intervals
Yes	68.6	53.1	61.5	61.3
No	31.4	46.9	38.5	38.7
Anglers interviewed	35	32	26	93

7. Question: If the closure of tributary streams to angling benefitted the cutthroat fishery in the main river would you support the closures?

Response:	Interval			All
	I	II	III	Intervals
Yes	50.0	16.7	36.0	35.2
No	50.0	83.3	64.0	64.8
Anglers interviewed	36	30	25	91

Table 17. Species composition (%) for trout creeled during the Big Creek census, by interval, 1974.

Species	Census Interval I	II	III	Census Mean
Cutthroat	71.3	91.7	90.4	85.9
Brook trout	14.9	5.7	8.5	9.0
Rainbow trout	13.8	2.5	0.1	5.1

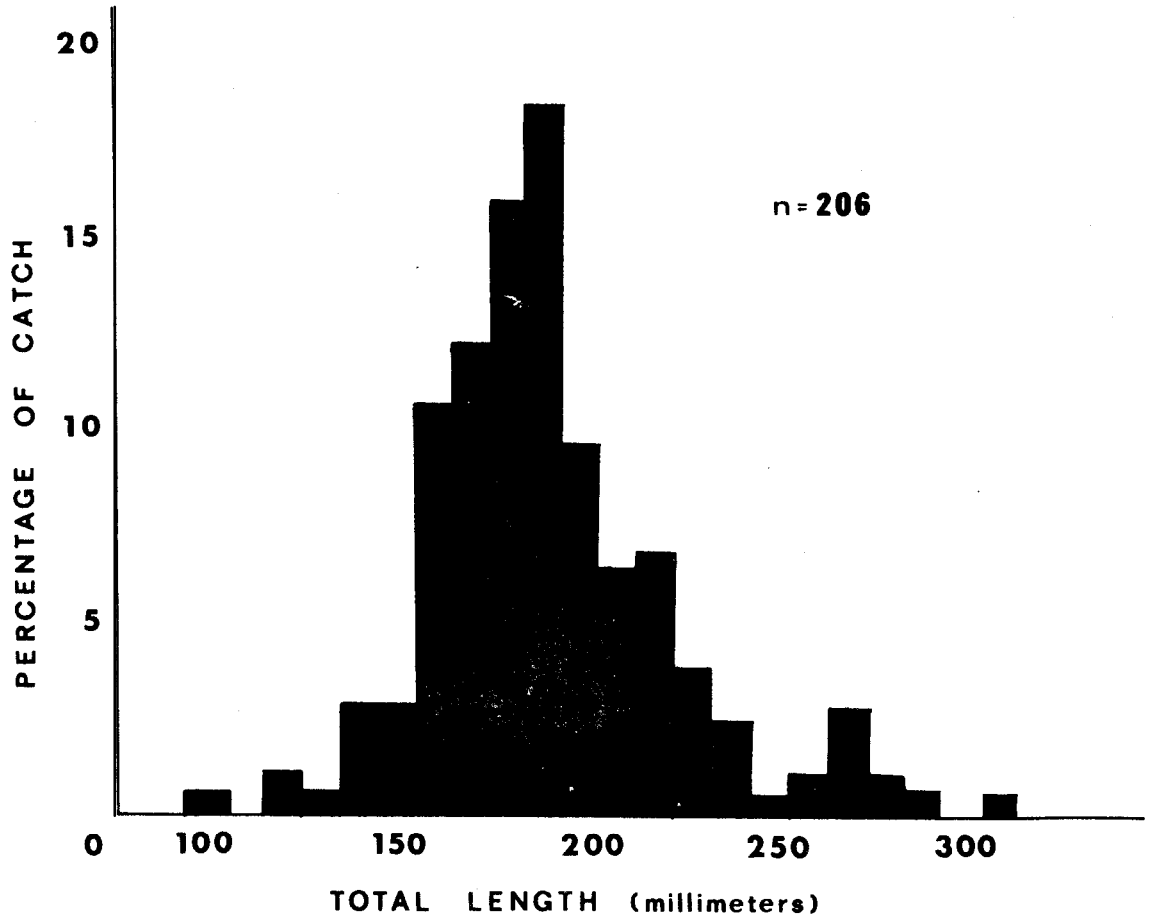

Figure 9. Length frequencies of cutthroat trout caught by anglers during the Big Creek creel census June to September, 1974.

The density of trout fry in sections 3 and 4 increased throughout August in Beaver Creek in 1974 (Table 18). These fish were all wild cutthroat trout fry. In 1974, the density of cutthroat fry in section 3 was twice that in section 4. In 1973, we released fry into section 4 and the densities of fry were the same in both sections 3 and 4 (Bjornn and Thurow, 1974). We counted fewer fry in sections 3 and 4 in 1974 compared to 1973. Since the spring runoff in 1973 was less than average while the runoff in 1974 was larger than average$_s$ the smaller runoff in 1973 may have contributed to better survival of trout embryos and the runoff in 1974 may have reduced survival and fry abundance.

Our count of age I and older cutthroat in 1974 was nearly twice as large as the 1973 counts for both sections 3 and 4 (Table 18). The largest increases in density occurred for small and medium sized cutthroat. These density increases may have been a result of several factors including: increased survival of older trout due to the special angling regulations, better stream conditions for embryo survival and past introductions of cutthroat trout fry.

Table 18. Mean numbers of cutthroat trout counted in test sections of Beaver Creek, Idaho, 1974.

Section	Transects/ section	Size group	Fish/Transect July 27	August 10	August 21	August 31	Mean (7/27-8/31)
3	49	Fry	0.3	7.1	11.1	10.7	9.6[1/]
		Small	9.2	10.9	11.2	10.8	10.5
		Medium	4.9	6.7	6.8	7.3	6.4
		Large	3.2	3.3	2.6	2.3	2.8
		(Total age 1+)	17.3	20.9	20.6	20.4	19.7
4	44	Fry	0.0	1.7	4.4	6.5	4.2[1/]
		Small	6.5	9.0	10.4	8.5	8.6
		Medium	5.7	6.6	6.1	6.4	6.2
		Large	3.5	3.2	2.7	2.7	3.0
		(Total age 1+)	15.7	18.8	19.2	17.6	17.8

[1/] July 27 fry count not included in mean.

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During the past two years of this research in the St. Joe River drainage, research aides contributed their skills and energies to the project. We acknowledge and thank Bruce Reininger, Dale Kirkbride, Ken Meilcarek, and Bob Wilson for their various contributions.

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JOB PERFORMANCE REPORT

State of Idaho

Name: ST. JOE RIVER CUTTHROAT AND SQUAWFISH INVESTIGATIONS

Project No. F-60-R-6

Title: Squawfish Studies--St. Joe River

Job No. 2

Period Covered: 1 March 1974 to 28 February 1975

ABSTRACT:

The objective of this job was to evaluate a squoxin (selective squawfish toxicant) treatment and to improve techniques for application. Plans called for treating the lower 30 miles of the St. Joe River with squoxin at a concentration of approximately 70-100 parts per billion in late June or early July, 1974. Efficiency of treatment is greatest during that period when peak numbers of migratory squawfish occur in the river.

Flows at Calder on the St. Joe River during early July were running very high (3,000-4,000 cfs) due to a heavy spring runoff. Treatment at these flows would have been cost prohibitive since concentrations of 80 ppb would have required an application rate of 20 gallons per hour. A postponed treatment in late July would have been inefficient since post-spawning emigration of adults would have occurred by that time. We therefore cancelled treatment plans for 1974.

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